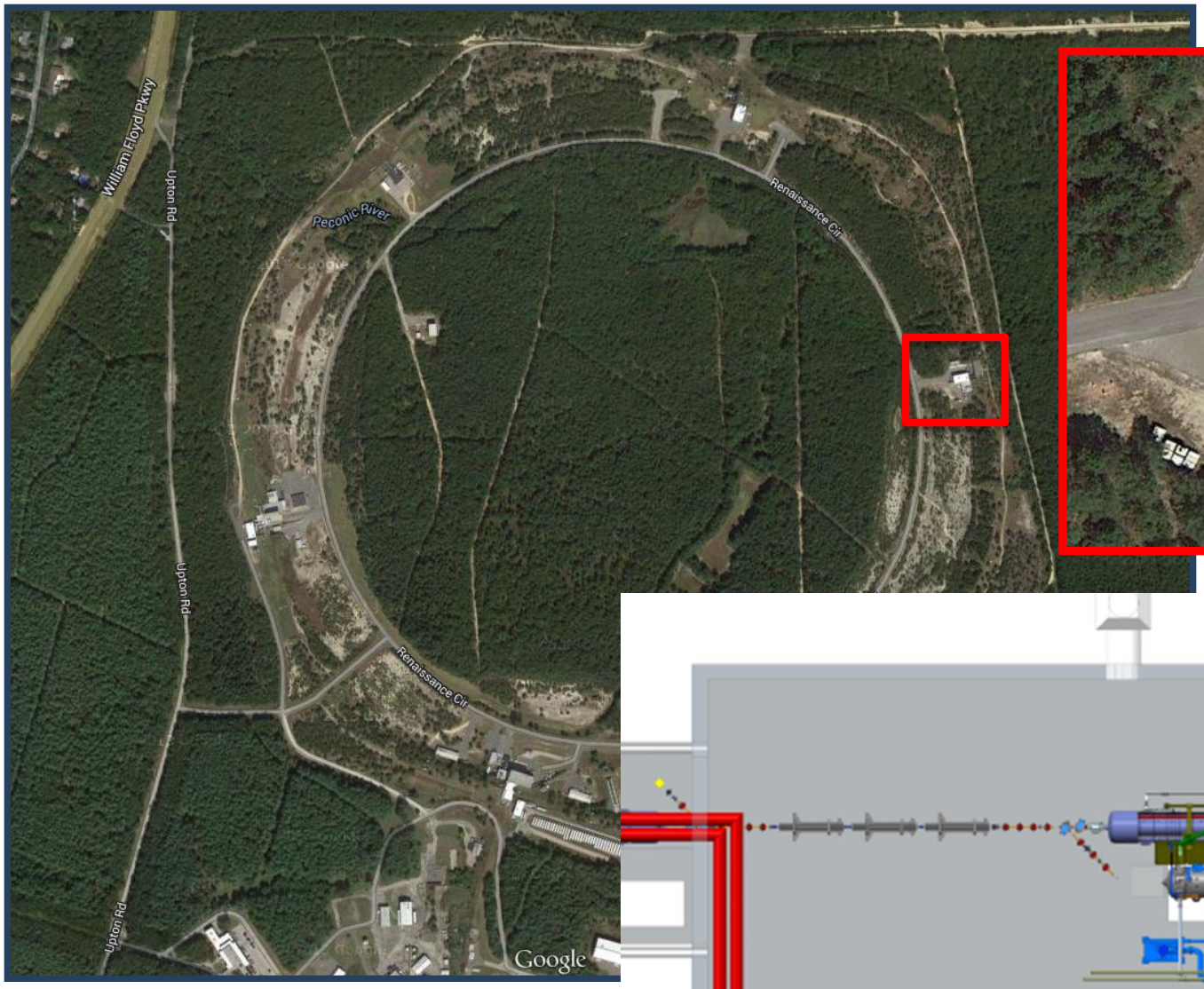
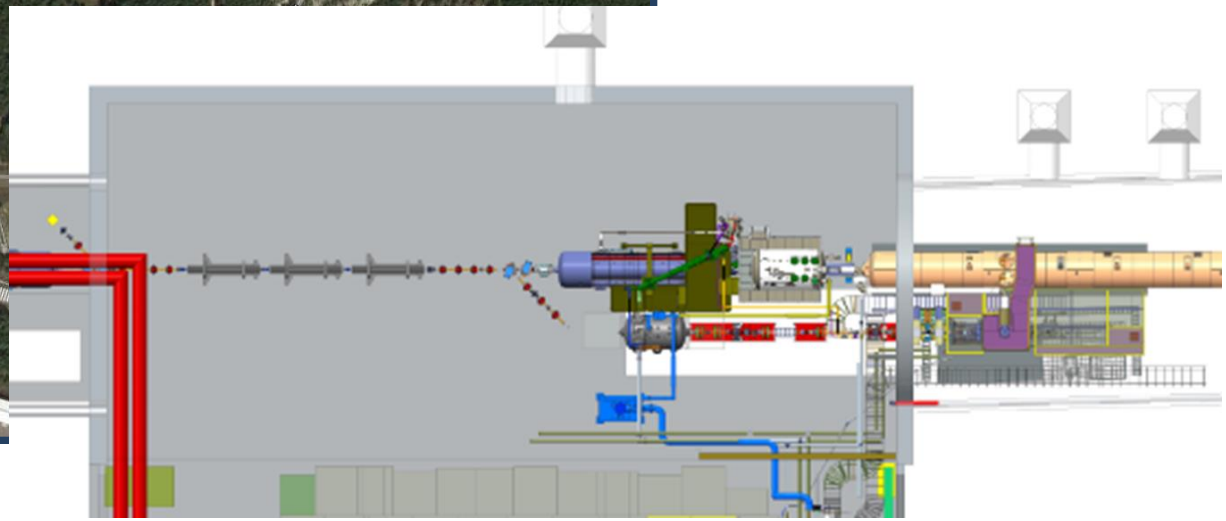
Coherent electron Cooling – Proof of Principle
Overview of Construction Progress,
Final Installation Planning

J. Tuozzolo, C-AD Chief Mechanical Engineer
(CeC Project Engineer)

- System Design Overview
- Phased Installation Plan
- Progress to Date, Major Component/Systems Status
- FY 2015 End Game

Location – RHIC 02:00 Region





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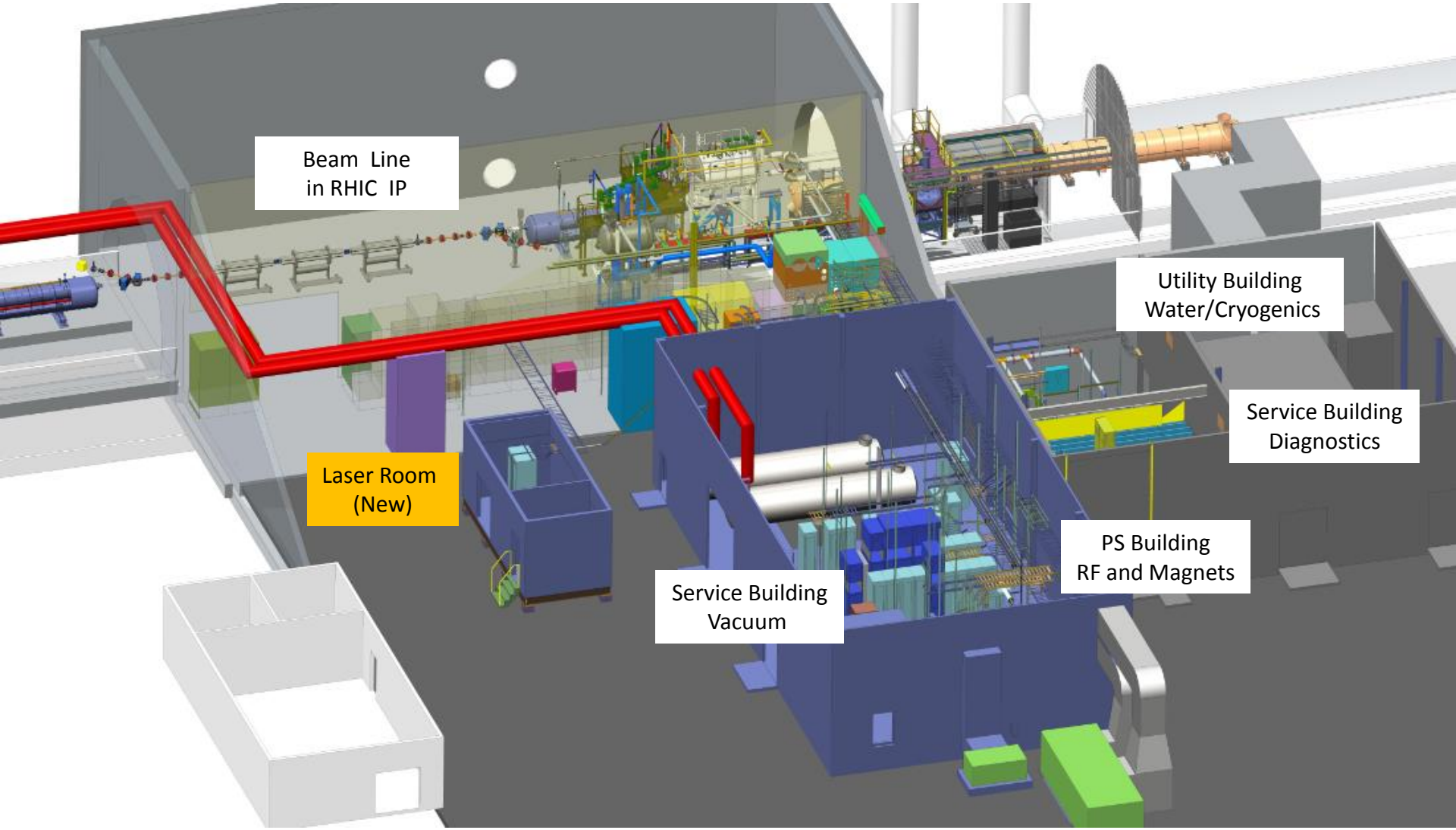
CeC PoP Final Configuration

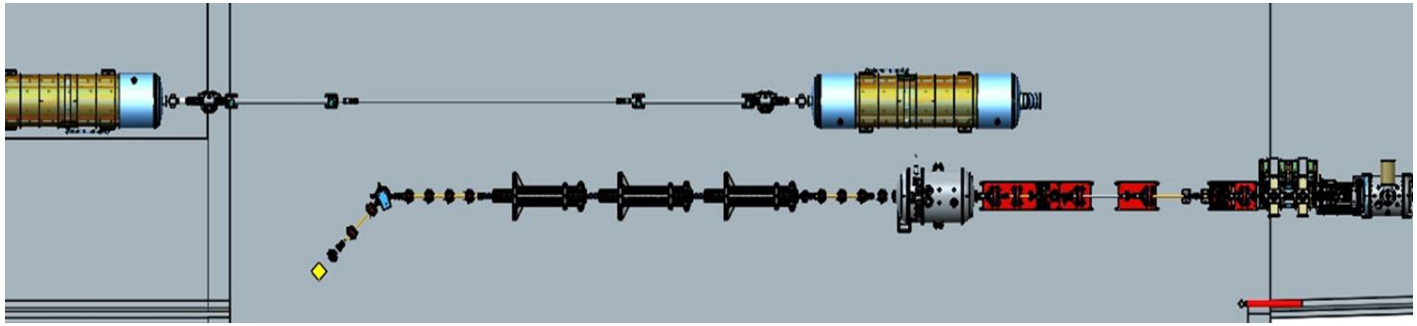


Phased Installation

Phase “0”: Rebuild, Install, and Test “Free” Buncher Cavities

Phase 1: (2014)

- Install and commission 112 MHz cavity and PA
- Install and commission 112 MHz cavity cryogenic system
- Install, align, and test cathode insertion system
- Install, align, and commission FPC



Phase 2: (2014)

- Install and commission eGun laser systems
- Install and commission ~~704 MHz cavity~~
- Install and commission ~~undulator magnets~~, beamline components, and beam dump.

Phase 3: (2015)

- Install and commission in RHIC beam line w/704 MHz & undulators.

Phase “0”

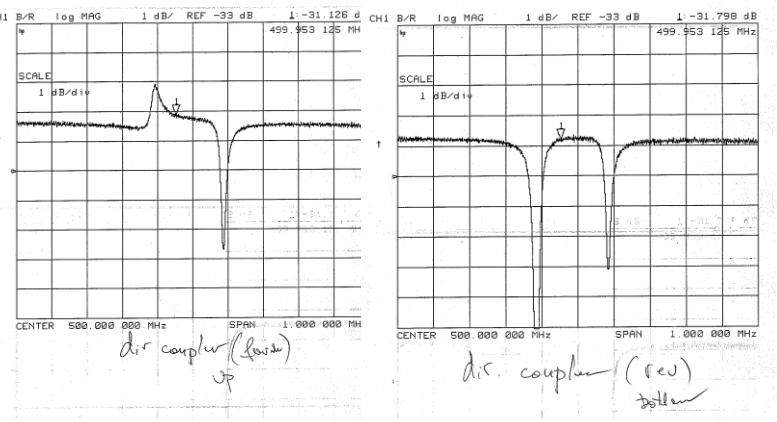
Refurbish, Install and Test Buncher Cavities.

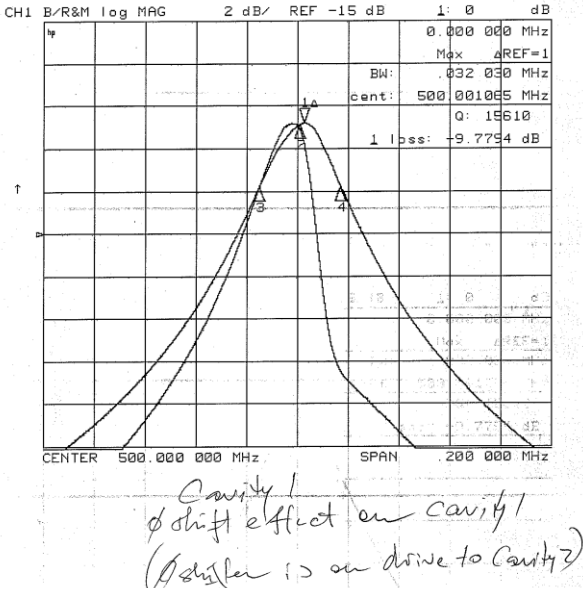
- Total rebuild: new cooling lines, cleaned and resealed windows, new seals, vacuum pumps and valves, rebuilt tuner drive.
- Cleanroom prepped and vacuum baked.
- New PA installed.
- New RF Coax installed.

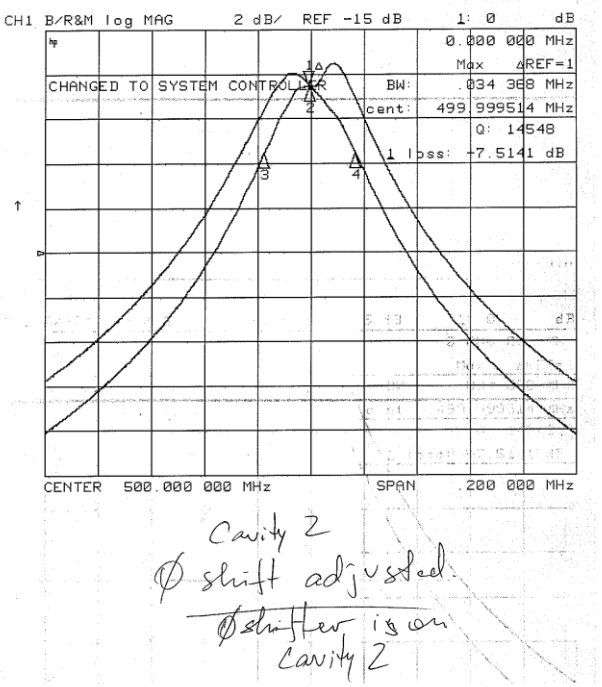
Phase “0” testing - Test Buncher Cavity

Cavity test done July 17: (Zaltsman)

- Tested and conditioned both cavities
- Moved tuners and the phase shifter.
- Cavities are very strongly coupled



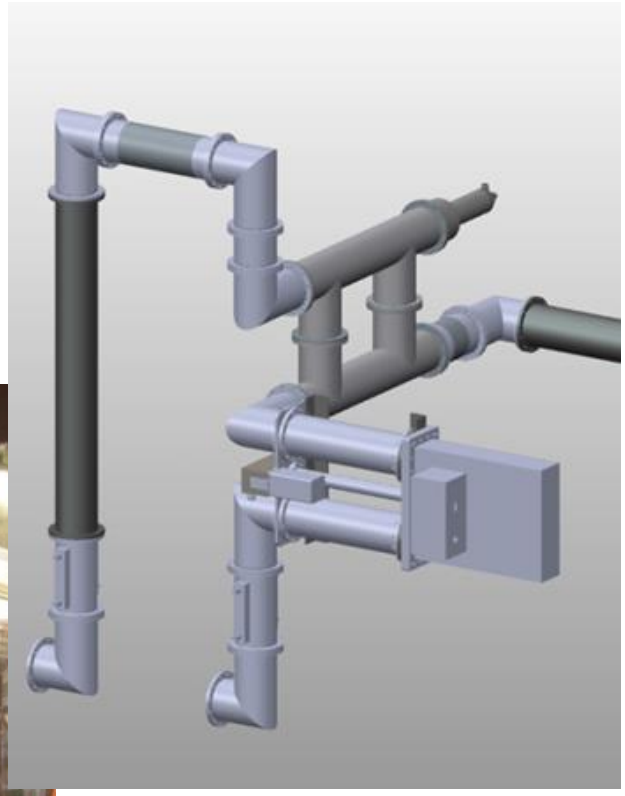




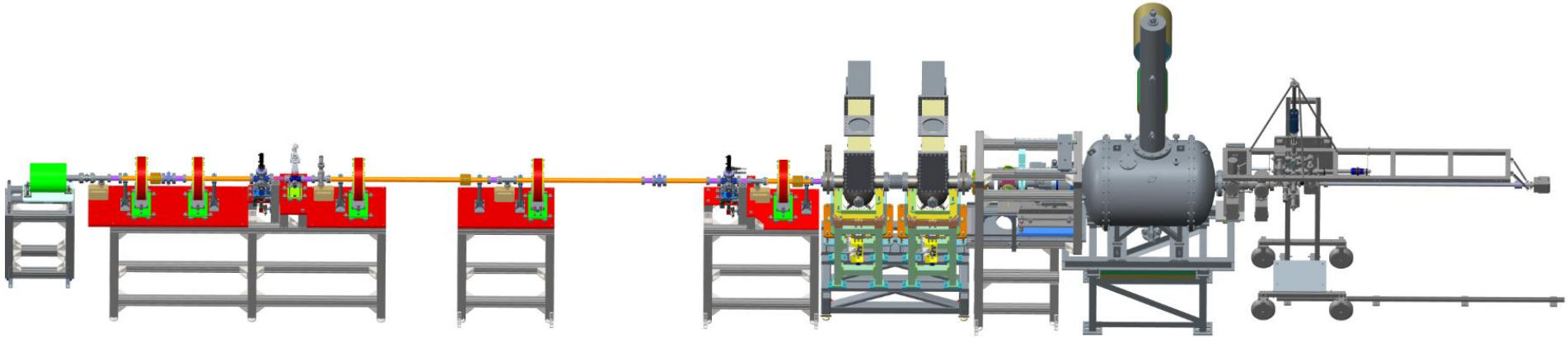
Phase “0”

Buncher Cavity Conditioning Results:.

- “Cross-talk” in RF coax
- New coax splitter section installed
- Testing underway



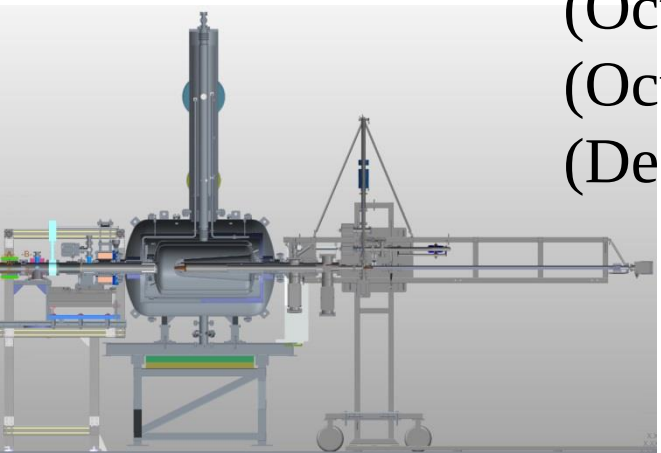
Phase 1 – Beamline installation and 112 MHz Cavity Testing



CeC Phase 1 goals:

- Install 112 MHz Cavity, Support Systems, and Cathode
- Install Beamline and Low Intensity Dump
- Make 112 MHz Cavity Cold and Test

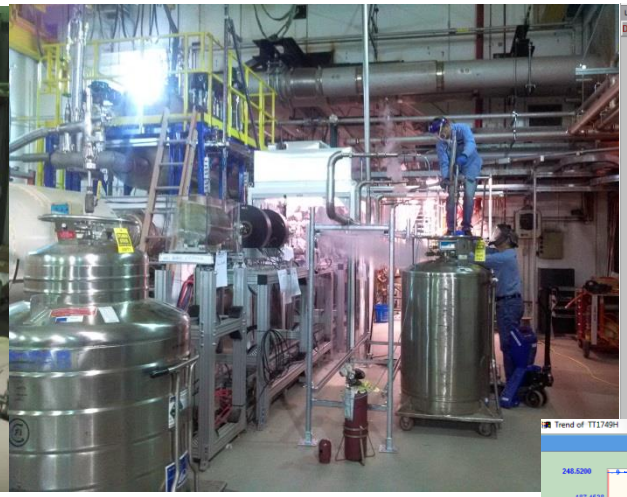
(October 20)“dry run”, ASSRC walk through
(October 27) cold test
(October 30) conditioning underway
(December 4) **2 MV !!**

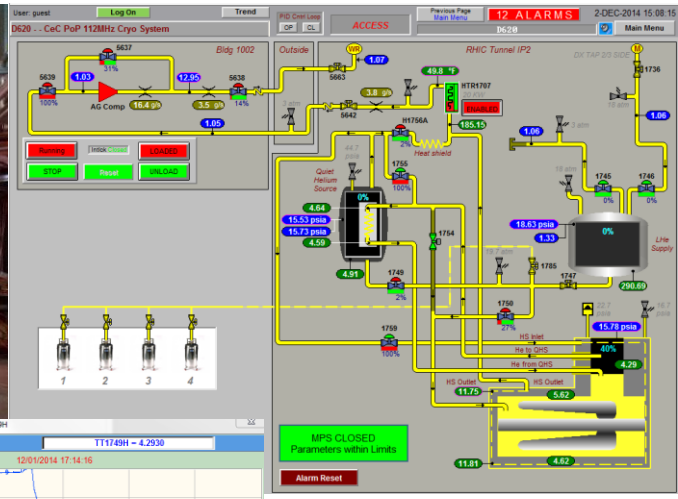


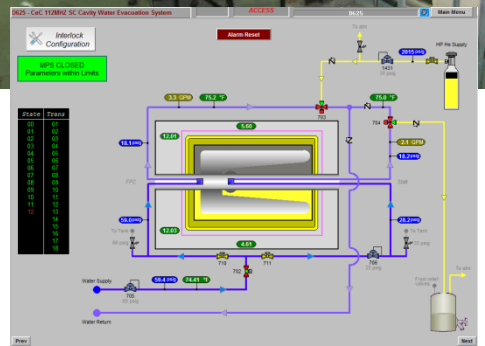
112 MHz Cavity Systems Installed and Tested

112 MHz Cavity Systems ready cryogenic operations:

- Quiet Helium heat exchanger delivered and installed.
- Helium recovery system installed and commissioned.
- Cryogenic control system operational.
- RF PA and associated systems installed and commissioned.
- Cathode stark and cathodes installed, aligned, and inserted.
- Cathode stark and FPC water systems operational and interlocked







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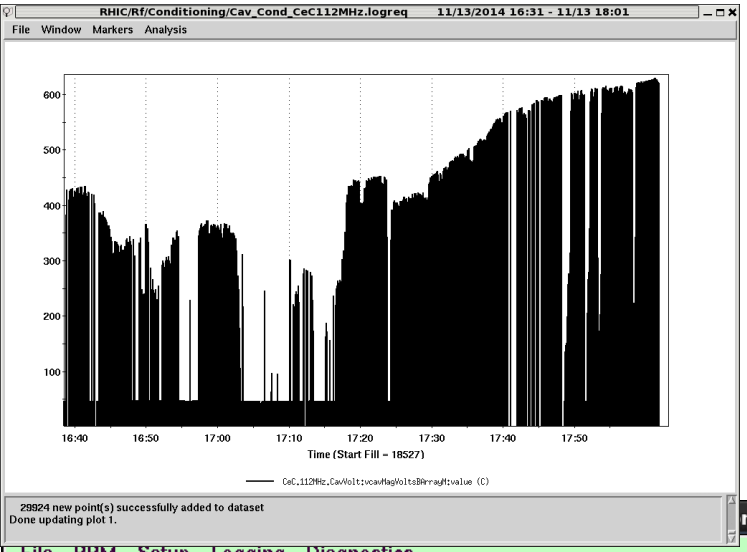
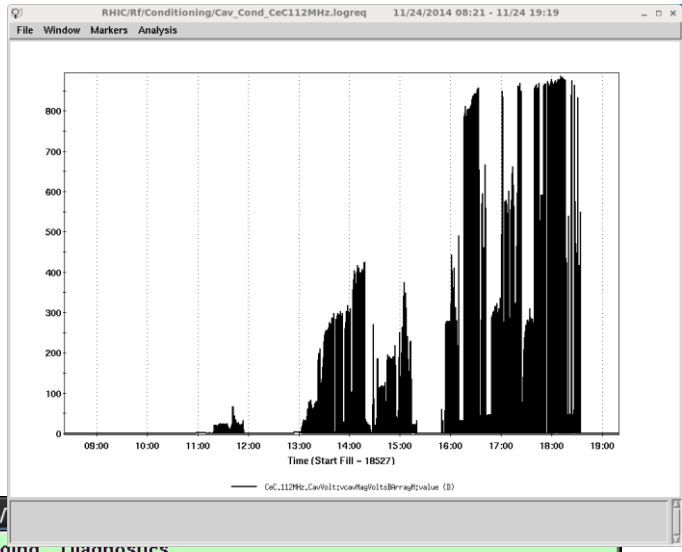
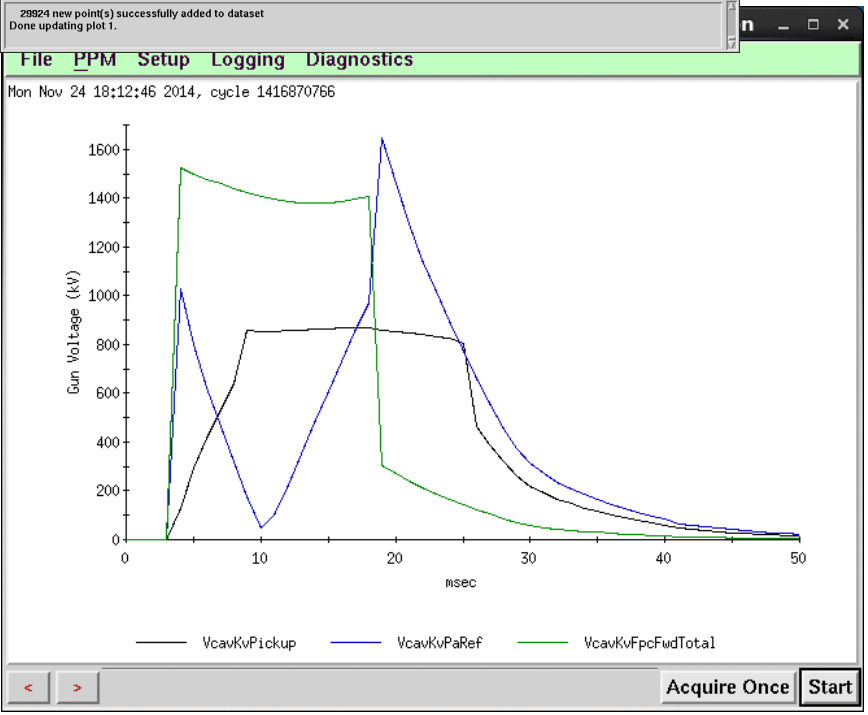
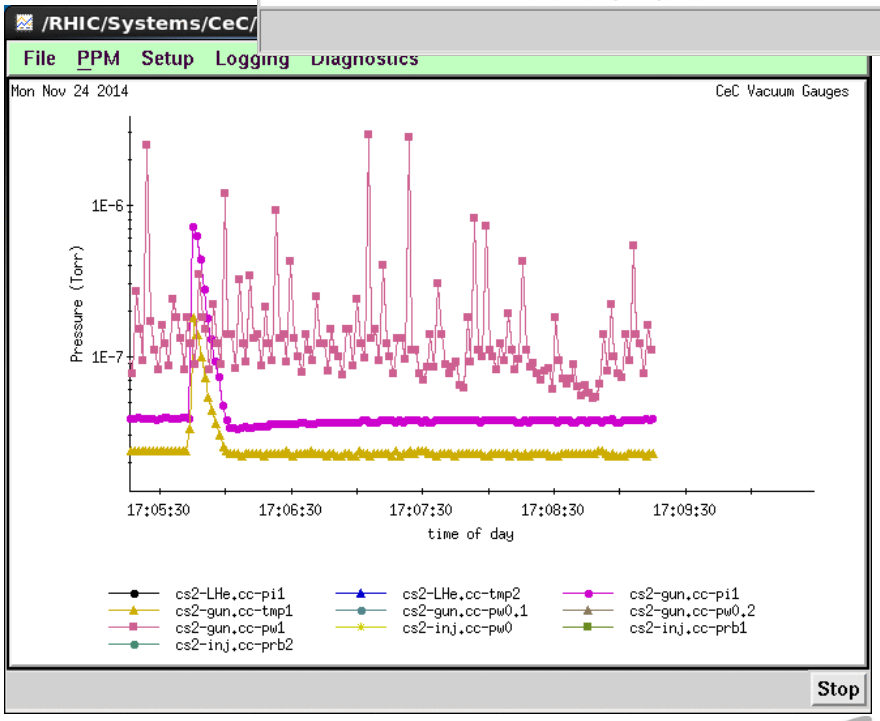
Phase 1 conditioning 112 MHz Cavity



Progress and Plans: Vladimir and Igor's talks



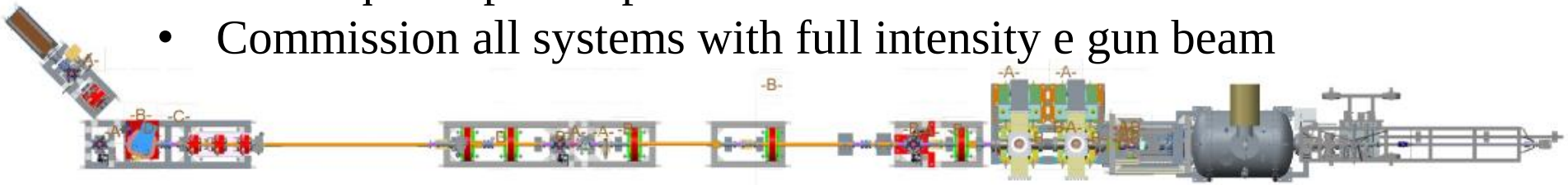


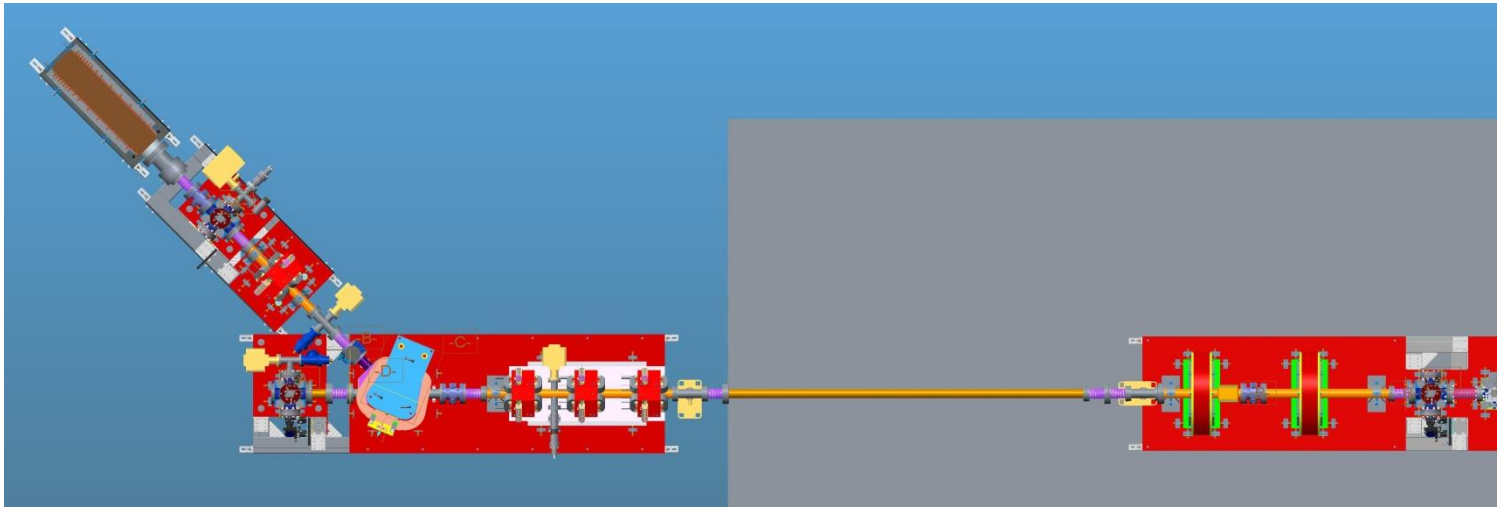


Phase 2.1 2014 (run 15)

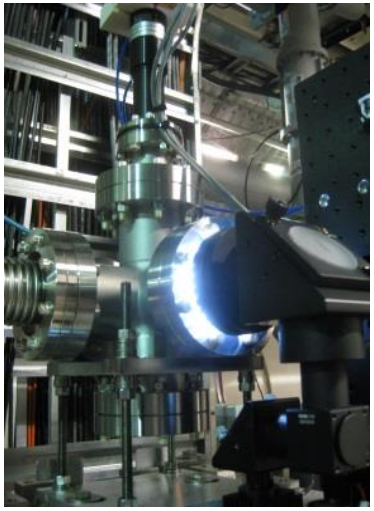
Phase 2.1: by-pass beam tube for 704MHz/no undulators.

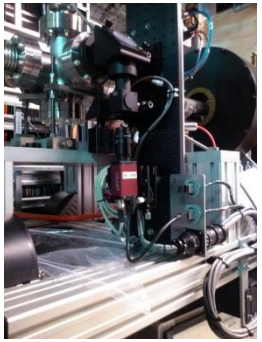
- Install laser and laser fiberoptic in support building
- Install high intensity 8 kW beam dump.
- Complete beam dump line with beam diagnostics
- Install 45^{o} dipole for beam diagnostics
- Install quadrupole triplet
- Commission all systems with full intensity e gun beam





Phase 2.1 Beamline Components





Low intensity beamline complete (Phase 1)

- Laser system in house, building ready
- 45^{o} Dipole Magnets – Buckley Systems in house
- Quadrupole Magnets – NETC in house. Survey and install.
- Beam dump – being assembled
- Beam diagnostics – being assembled
- Vacuum hardware – being assembled

Estimate Phase 2.1 high intensity beamline complete March 2015

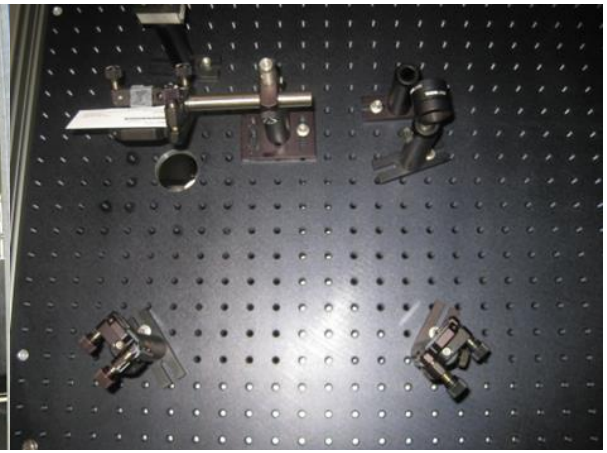
Phase 2.1 testing - 112 MHz Cavity run 15

112 MHz Cavity Ready for RHIC Operations:

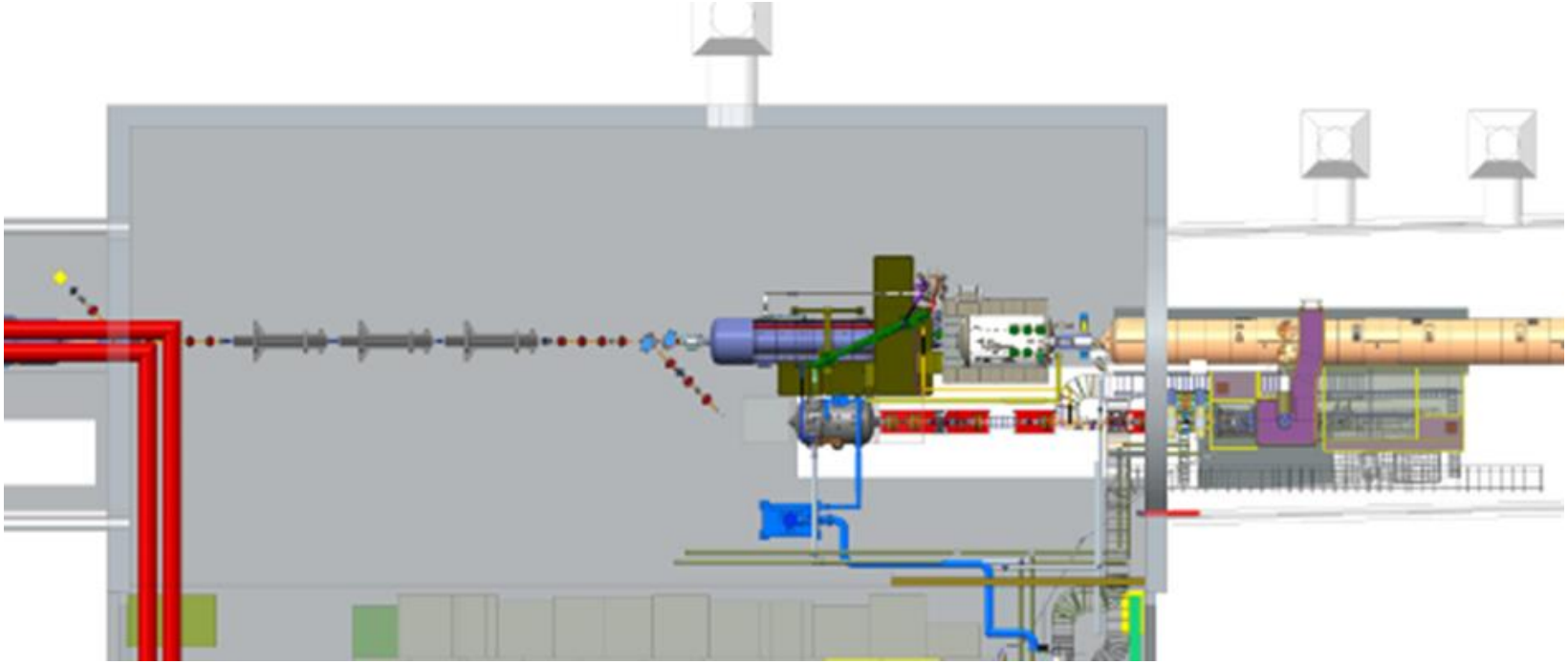
- Cold vapor piping from phase separator to compressor warm return.
- 2.4 kW return heater for the above.
- System ready for operations January 26, 2015.

Laser Ready for Operations:

- Building installed and powered
- Communications being established
- Laser in house ready for installation
- Laser fiberoptic cable delivered, fiberoptic conduit installed



Phase 3: High Energy Beam Line Installation - 2015



- Install 704 MHz Systems and supporting cryogenic system
- Install Undulator Magnets
- Install RHIC beam line components: dipoles, quads, correctors, vacuum
- Install beam diagnostics (Toby)
- Modify and install RHIC DX-DO chamber for FEL light diagnostics
- Move CeC beam dump line to final location

Phase 3 - 704 MHz 5 Cell Cavity From Niowave

Niowave order Meyer Tool: ASME code cryostat (delivery, 12/15/2014)

Niowave (prototype) tuner design tested.

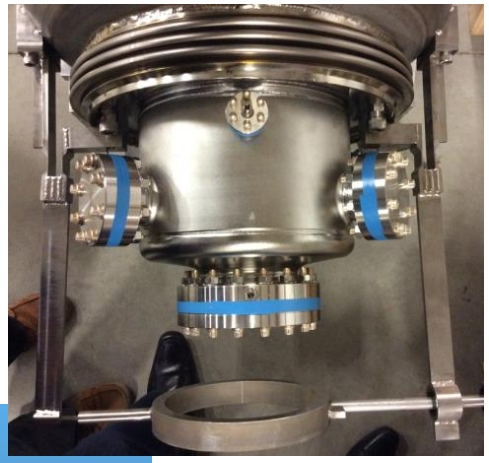
Niowave needs to clean the AES cavity. (Argonne, December)

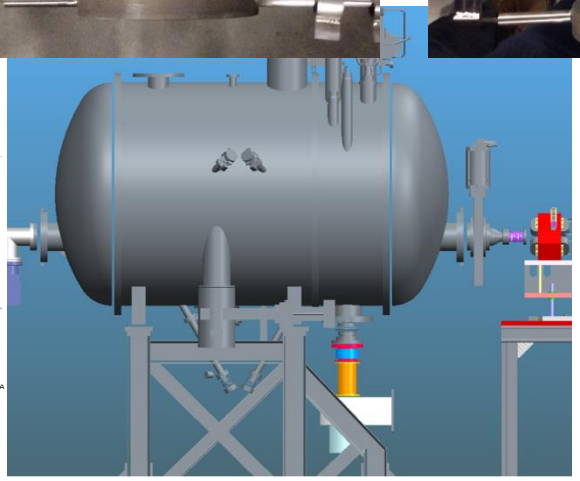
BNL provides RF shielded beamline valves and ion pump with pumping Tee.

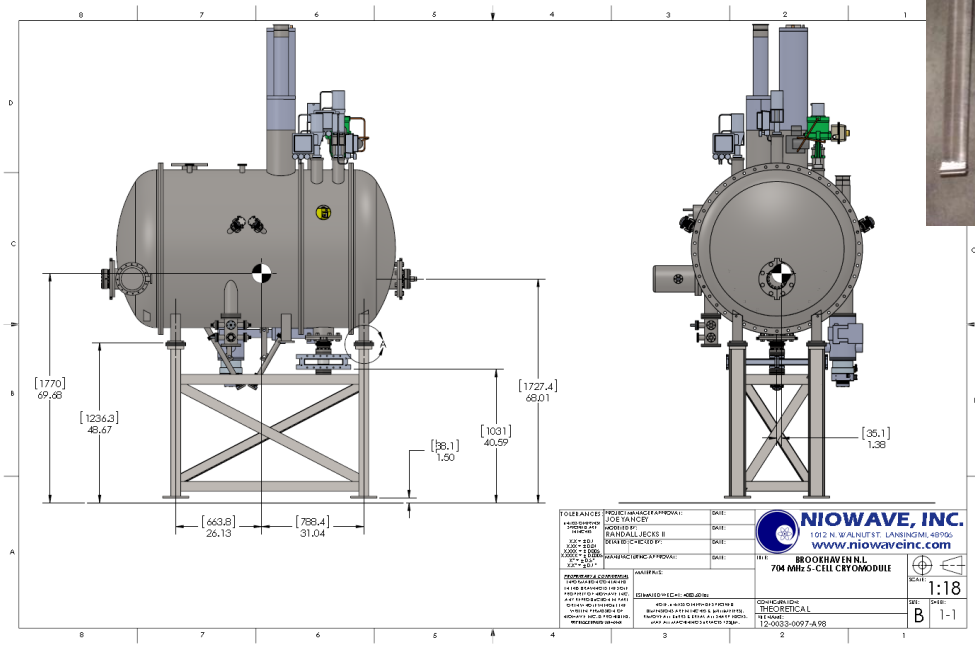
Delivery date from Niowave – April 30

Coax in house being installed

PA shipped January 2015

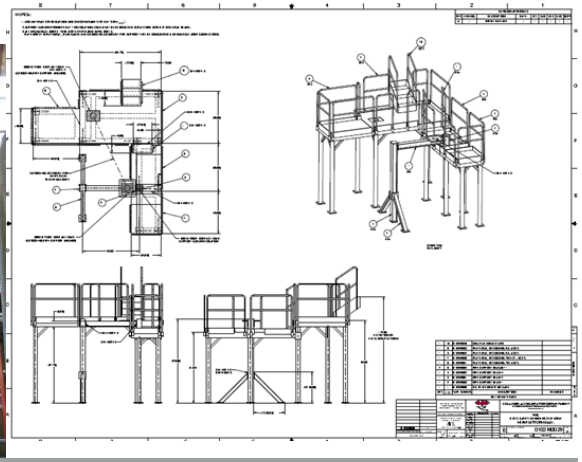


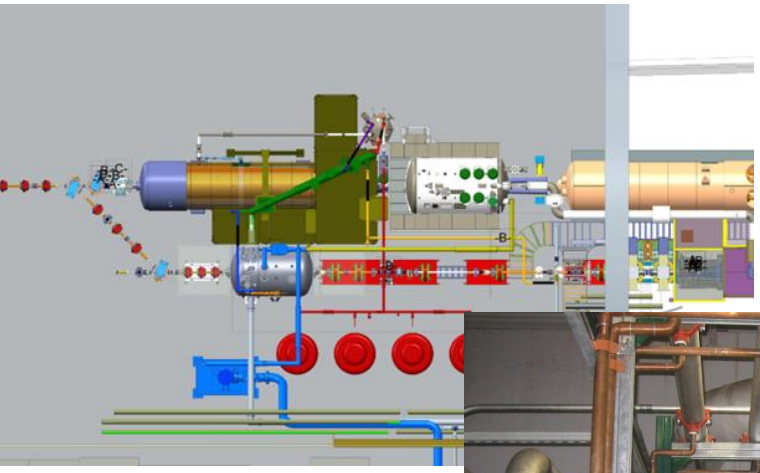


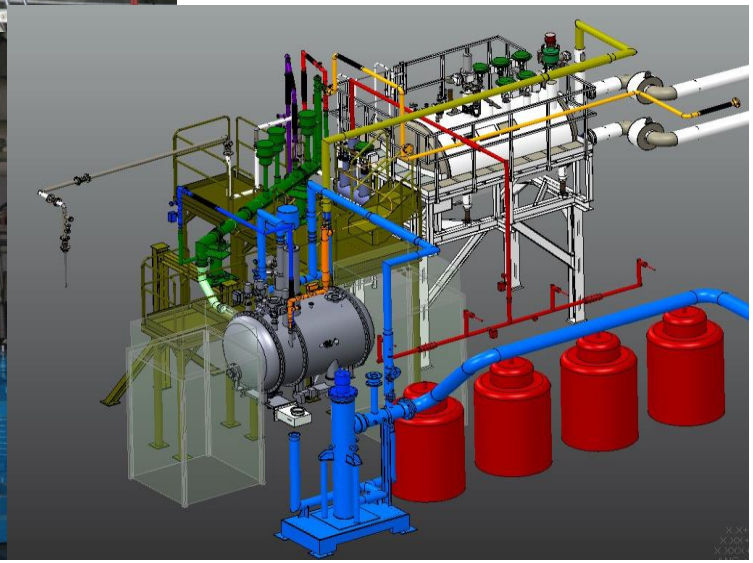


Phase 3 - 704 MHz Cryogenics

- Integration with LEReC supply and return requirements complete
- All components ordered: VJP (green monster), heater return (blue), cooldown return (lime green to QHS heater), heater skid.
- Warm return vacuum header installation
- 704 MHz scaffold order

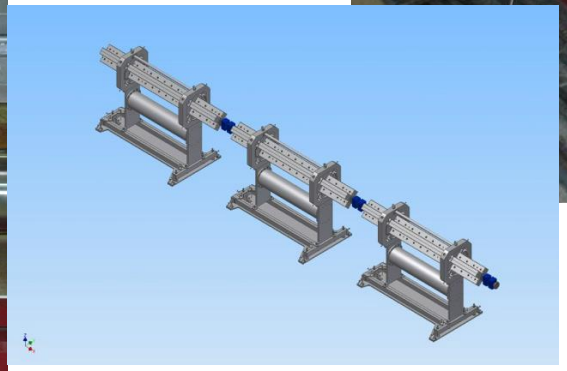






Phase 3 - Undulators

Magnet fabrication and testing near complete
Shipping delayed until January 2015
Assembly and magnet measurement at BNL Spring 2015
Installation summer 2015



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Summary

- Progress continues on component installation and commissioning.
- 112 MHz electron gun ready for beam commissioning during RHIC run.
- Major component deliveries have delayed high energy commissioning schedule.
- As a result: 1 year schedule float has evaporated; but, on track for RHIC 2016 run commissioning and operations.
- Critical deliveries: 704 MHz cavity and undulator magnets expected in spring 2015; installation summer 2015.